Prediction of debris flows with multi-electrode geo-electric method in the Austrian Alps and its possible application in global high mountain regions

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As a part of the geophysical research program of the Austrian Academy of Science, a highly active mass movement area in the Northern Calcareous Alps of Austria has been investigated along selected cross sections by 2d-multi-electrode-geo-electric measurements with the STING/SWIFT system (by AGI). Correlating the so sampled data with geologic field mapping has proofed as a tool for the interpretation of actual shallow sedimentation processes (up to 100m of depth), such as i) movement horizons, ii) consolidation and compaction of transported material, iii) detection of moisture and water saturation as well as iv) distribution of solid rock from mass movement sediments. Triggered by high precipitation rates (ca. 2500mm/a; max. 200mm/d) as well as snow melt waters, the biggest spontaneous mass movement for decades has occurred there in Spring 2006: a so far never described Sackung in the calcareous hardrocks was followed by a rapid debris flow in the outcropping marls with a total dislocated Volume of 125.000m^3. This catastrophic chain reaction of rapidly occurring mass movements close to an area of human settlements has confirmed the results of the multi-electrode geo-electric cross sections through this area measured in summer 2005. So this research goal highlights the method to become a useful and helpful tool for predicting such kind of mass movement events in tectonically and lithologically similar positioned areas or with similar distribution of sediments. As investigated by the same research team, possible applications of this method for protecting endangered cultivated landscape and human beings could be i) investigation of debris fans concerning their remobilization by water infiltration (f. i. in the Himalayas), ii) investigation of temporary lake damming landslide barriers concerning their stability and life span (f. i. in the Himalayas and the Tian Shan regions), iii) investigation of pyroclastic sediments on the flanks of volcanos concerning their remobilization by increasing pore water pressure (f. i. at Mt. Pinatubo, Philippines) as well as iv) investigation of Löss sediments concerning their instability on mountain flanks and terraces under natural and anthropogene influence (f. i. in the Loess plateau of PR China).